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Acklesh Prasad

University of Queensland, a.prasad@business.uq.edu.au

Jon Heales

University of Queensland, j.heales@business.uq.edu.au

Peter Green

University of Queensland, p.green@business.uq.edu.au

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Information Technology Resources, Complementarities and Capabilities: Towards a Deeper Understanding of Leveraging Business Value from IT

Acklesh Prasad

UQ Business School
The University of Queensland
Brisbane, Queensland 4072
AUSTRALIA
a.prasad@business.uq.edu.au

Jon Heales

UQ Business School
The University of Queensland
Brisbane, Queensland 4072
AUSTRALIA
j.heales@business.uq.edu.au

Peter Green

UQ Business School
The University of Queensland
Brisbane, Queensland 4072
AUSTRALIA
p.green@business.uq.edu.au

ABSTRACT

Organisations devote substantial resources to acquire information technology (IT), and explaining the important issue of how IT can affect performance has posed a significant challenge to information system (IS) researchers. Owing to the importance of expanding our understanding on *how and where* IT and IT-related resources impact organisational performance, this study investigates the differential effects of IT resources and IT-related capabilities, in the presence of platform-related complementarities, on business process performance. We test these relationships empirically via a field survey of 216 firms. The findings suggest that IT resources and IT-related capabilities explain variance in performance. Of interest is the finding that IT resources and IT-related capabilities ability to explain variance in business process is further enhanced by the presence of the platform-related complementarities. Our findings are largely consistent with the resource-based and complementarity arguments of sources of IT-related business value.

Keywords

IT resources, IT related-capabilities, Business process performance, Resource-based and complementarity theory.

INTRODUCTION

It has been long recognised that IT investments are important for continued growth and development of businesses. While there is little question that IT helps to enhance business value, there is less clarity on the specific firm characteristics that lead to IT's ability to contribute to business value (Tallon, 2007). Current arguments, while supporting continued investment in IT, concur that better business value may emerge from organisation's unique combinations of IT-related resources, which are valuable, scarce, and difficult to imitate (IT-related capabilities) (Wade and Hulland, 2004). However, to date, research in this area has provided mixed empirical results (Wade and Hulland, 2004), and there is scope do more to understand how these resources and capabilities could be utilised and where greater business value could be generated.

In this study, we suggest that successful utilisation of IT resources may require significant organisational changes. These organisational changes could act as complementarities to IT resources and IT-related capabilities. Essentially, there may be existence of a synergy between these factors, IT resources, and IT-related capabilities, which needs to be recognised. With the current focus on efficient management and use of organisational IT and other resources (Tallon, 2007), we suggest that it is important to establish and promote a platform, which is a combination of related organizational factors whose coordinated change may stimulate exploration of IT resources and IT-related capabilities. While we have gained some understanding on how capable resources may contribute to business value through the resource-based view lens (see for example Ray, Muhamma and Barney, 2005), understanding how these capabilities and IT resources may contribute to business value in the presence of capability-exploration related synergies will provide an additional dimension to our understanding of value

creation in organisations. In addition, choosing the correct path for measuring value creation in organisations is also pertinent. We propose that IT resources and related capabilities, in a synergised complementary environment, establish an ideal environment. This environment creates an information base that allows business to better carry out their core function of customer service. Once it is achieved, business should see its benefits in their internal business processes.

Thus, the aim of this study is to understand how IT resources and IT-related capabilities, in the presence of platform related complementarities, contribute to their core function of customer service, and its subsequent implications on internal business process performance. This paper is organised as follows. The next section provides a literature review on IT value research, followed by discussion of the theoretical framework and the propositions. Then we present our methods and results. In the final section, we discuss the results, and provide directions for future research.

LITERATURE REVIEW

The term ‘IT business value’ refers to the organisational performance impacts of IT at various levels (Melville, Kraemer and Gurbaxani, 2004). For decades, research has attempted to understand the relationship between the IT investments and certain aspects of business value. While the earliest studies did not find a positive relationship between IT investments and firm performance, within the production economic approach, using the output elasticity concept, studies found IT investment output elasticity as high as 0.1. This was the first evidence of a positive association between IT investments and firm performance. Consequently, Brynjolfsson (1993) suggested “a shortfall of evidence may not necessarily be the fall of IT productivity”, and raised the issue that even earlier applications of IT could have led to tangible benefits. There was a suggestion that there is a need to refocus on how we model the relationship between IT investments and performance. To this note, Barua and Lee (1997), using the same data as Loveman (1988), found that IT’s contribution was indeed significant and IT contributed more to revenue production than either labour or non-IT capital expenditure.

Consequently, IT productivity research expanded, and the focus shifted to what measures were appropriate. The process-oriented studies, which considered multidimensional predictor variables, attempted to understand hypothesized relationships between IT and other input factors to performance measures at various levels of aggregation. This concept proved important as it emphasises the importance of following an appropriate path through which the business value accumulates. In addition, this concept essentially highlighted that IT may not be the only important factor at the input side. Specifically, the existence of synergy between IT and related complementarities needed to be modelled in understanding the environment within which IT may contribute to value creation. Amongst others, Barua et al., (1995), applying arguments similar to critical success factors, considered the impact of IT and other related factors on intermediate measures and relating these intermediate measures to financial performance. They argued that this approach helped to open the “black box” of IT usage, and detect and measure IT impacts where they occur.

Recent research has attempted to understand IT impacts in organisations using the resource-based view (RBV) of the firm. Based on the premise that it is how firms leverage their investments with their unique IT related resources and skills that determine the firm’s overall effectiveness, the RBV has proven to be useful in the IT context, as it provides a robust framework for analysing whether and how IT may be associated to business value (Melville et al., 2004). Researchers have used the resource based view to theoretically and conceptually study the sustained competitive advantages (SCA) of IT (Mata, Fuerst and Barney, 1995). Recently, there has been an increase in the stream of research that complements the prior conceptual assertions and uses the resource based view to evaluate ITs contribution to SCA (Ray et al., 2005). Researchers have also started to employ the resource perspective to expand and deepen our understanding of IT business value (Bharadwaj, Bharadwaj and Konsynski, 2000), and found that firms with superior IT capability also exhibit superior firm performance.

We infer that the level of IT investment, while it may not be a unique advantage, is rather a necessity, as failure to invest in IT resources may put firms at a disadvantage. Further, we suggest that IT business value may be enhanced by firms’ unique IT-related capabilities. We also infer that in addition to IT resources benefiting from the synergy between related complementarities, the potential of the IT-related capabilities could be further enhanced if there is a complementary environment that stimulates these capabilities. Thus, the potential of the resource based view and the importance of a stimulus suggested by the complementarity perspective implies the existence of an interesting and important synergy between them. These two theoretical perspectives are discussed next, and this discussion forms the basis for our propositions.

THEORETICAL FRAMEWORK

The resource based view of a firm argues that firms possess capable resources, a subset of which enables them to achieve competitive advantage and a further subset leads to superior long term performance (Wade and Hulland, 2004). This notion is especially pertinent for IS research, as IS resources are widely available, and thus may have limited direct influence on sustained business performance. Rather, information systems exert their influence on firms through complementary

relationships with other assets and capabilities (Clemons and Row, 1991). Under the lens of the RBV, there is growing evidence that competitive advantage depends on firm's superior deployment of capabilities, because these capabilities become embedded in a company and are difficult to trade (Wade and Hulland, 2004). This concept of resource capabilities is based on two underlying assumptions developed in strategic management theory (Mata et al., 1995). First, resources and capabilities possessed by competing firms may differ (resource heterogeneity), and second, these differences may be long lasting (resource immobility). In relation to business value, the core argument of the RBV is that if the same resources are held by competing firms, they are not rare, and they cannot explain the variance in performance. Further, even if these resources are held only by a few competing firms, they are also not costly to imitate, and will rapidly diffuse amongst competitors. Hence, valuable resources' ability to explain variance in performance across competing firms depends upon how rare and costly are they to imitate. A resource is likely to be costly to imitate in the presence of isolating mechanisms such as path dependence, causal ambiguity, social complexity and team embodied skills (Barney, 1991), thus making them capable organisational resources (Wade and Hulland, 2004). While the characteristics of these IT-related capabilities have the potential to contribute to business value, within the lens of complementary theory, these capabilities could be enhanced if the organisations promote a complementary environment of capability utilisation.

The notion of managing technological and organisational change is rooted in the domain of organisational behaviour. Prominent theories like contingency theory suggest that organisational performance is an outcome of the fit between relevant variables. In addition, socio-technical theory asserts that organisational performance is impacted by the socio and technological variables. While these theories provide sound conceptual basis for understanding organisational change, they fail to provide theoretical basis for the connection between fit and business value. The complementarity theory (Edgeworth, 1881) is an old but powerful concept in economics, and has the basic premise of the establishment of an activity pattern (Milgrom and Roberts, 1990). The factors within this activity pattern should be complementary; advocating increasing one factor will increase the benefits when other complements are moved in the same direction. The theory asserts that to maximise organisational payoff, complementary factors must be changed in a coordinated fashion, in the right direction, and in the right magnitude. There is a need for a concerted change in a large set of variables. The complementarity perspective serves as an important framework for utilising IT resources and IT related capabilities in organisations.

PROPOSITIONS

While a wide variety of IT resources, IT platform related complementarities, and capabilities are pertinent to the process of creating value in organisations, examination of the literature and discussion with IS experts led to the identification of two IT resources, three IT platform related complementarities, and three capable resources that are prevalent across a variety of business processes and ones that could be modelled with the above theoretical framework. These resources are associated with conception, planning, implementation, synergising, and use of IT applications.

Information Technology Resources

Information technology has become a major facilitator of business activities in the world today. It is also a catalyst for fundamental changes in the strategic, structural, and operations management of organisations due to the capabilities of computerised information systems (Wreden, 1997). These IT capabilities are advancing at a rapid rate, and expanding power and declining costs enable new and more extensive applications of IT that make it possible for organisations to improve their efficiency and effectiveness (Turban, Leidner, McLean and Wetherbe, 2008). We propose two dimensions of IT resources as important for organisations. First, the level of raw dollar spending on IT is an important resource for business, and failure to invest in IT resources and capability may put firms at performance disadvantage, thus investment into IT has almost become a necessity. Second, Technical IT skills, which refer to general skills and expertise possessed by firms to develop their IT applications (Copeland and McKenney, 1988), are indispensable for the effective use of IT. It is an important resource, as it helps businesses in staying abreast of technology. Thus, we propose that:

Proposition 1: *The level of IT resources will be positively associated with business value.*

Capable Business Resources

We suggest the following three dimensions of IT-related capabilities as important in realising the benefits of IT.

Top Management Commitment - Successful IT deployment requires top executives act as 'business visionaries and prioritisers, supporting and articulating the need for IT, and communicating its functionality within the context of the organisation's strategy, structure and systems (Henderson and Venkatraman, 1993). Top management commitment enhances IT success as it makes IT resources available, supports and guides the IS functions, integrates IT with business strategy and processes, and ensures continuity in IT investments over time, and it is perceived to enhance the influence of the IT

investment on performance (Powell and Dent-Micallef, 1997). It is an important resource in organisations to enhance IT's ability to contribute to business value.

Shared Knowledge - Shared knowledge between Unit and IT managers may determine the strategic use of IT (Ray et al., 2005). Using absorptive capacity theory, Boynton and Zmud (1994) showed that an organisation's IT use is influenced by the presence of a mosaic of IT-related knowledge that binds the firm's IT and line managers. A major component of the firm's absorptive capacity regarding IT is represented by the conjunction of IT and business-related knowledge possessed and exchanged amongst the IT and line managers (Ray et al., 2005). Increasing level of shared knowledge between IS and line groups are linked with increased operational and service performance of the IS groups (Nelson and Coopride, 1996). Shared knowledge is, therefore, an important capability resource that enables the organisations to effectively implement and use IT applications in which the organisations have invested.

Flexible Information Technology Infrastructure - IT infrastructure has also been identified as a capability that can influence the firm's IT resources ability to contribute to performance (Duncan, 1995; Sambamurthy et al., 2003). IT infrastructure is a shared set of capital resources that provide the foundation on which IT applications are built (Duncan, 1995). A flexible IT infrastructure facilitates rapid development and implementation of IT applications (Ray et al., 2005) that enable organisations to respond swiftly to take advantage of emerging opportunities. A flexible IT infrastructure is a complete set of technological resources, carefully planned and developed over time (Ray et al., 2005), and this benefit could be long-term since infrastructure redevelopment is a time consuming and costly affair. Thus, we propose that:

Proposition 2: *The level of businesses' IT-related capabilities will be positively associated with business value.*

IT Resources and IT-Related Capability Stimulating IT-Usage Platform

Consistent with the complementary theoretical perspective, there are several common organisational factors that establish the platform for IT usage and can enhance the business value obtained from IT resources and organisational capabilities (Barua et al., 1995). We suggest three complementarities, which we group as 'IT-Usage platform', may enhance the value creation ability of IT resources and related capabilities.

IT Governance - IT governance is a management process that focuses on the responsibility and control of IT-related domains across key areas to ensure IT benefits the long-term sustainable success of a firm (Information Technology Governance Institute, 2006). IT governance is necessary for unified and faster decision making regarding deployment and use in order to compete with increasingly adaptive and agile competitors (Broadbent, 2005). IT governance also provides the organisational capacity to manage the formulation and implementation of IT strategy (Van Grembergen, 2000). Effective IT governance is crucial for an organisation to achieve its performance goals, and will also ensure that the current IT resources are appropriate for the ever-changing nature of business operations.

Organisational Design - Human resources are frequently "underutilised" because employees often perform below their maximum potential, and that organisational efforts to elicit discretionary effort from employees are likely to provide returns in excess of any relevant costs (Baily, 1993). Human resource practices could affect such discretionary effort through their influence over employee skills and motivation and through organisational structures and designs that provide employees with the ability to control how their roles are performed. Organisational design involves the specification of decision rights, and performance evaluation systems (Hitt and Brynjolfsson, 1997; Jensen and Meckling, 1992).

Incentive Systems - While a particular organisational design may result in better use of operational level knowledge, it can also exacerbate agency problems (Jensen and Meckling, 1992). In the absence of appropriate incentive systems, workers may not necessarily use their decision-making authority in the best interest of the firm (Hitt and Brynjolfsson, 1997). Appropriate incentive systems align the worker's goals to those of the organisation. Workers would seek appropriate compensation for their will to share knowledge.

Respectively, these complementarities set an ideal environment for use of IT resources and provide a platform that stimulates exploration of organisations IT related capabilities. Thus, we propose that:

Proposition 3a: *The level of IT resources, in the presence of an IT-Usage platform, will be positively associated with business value.*

Proposition 3b: *IT-related capabilities, in the presence of an IT-Usage platform, will be positively associated with business value.*

Business Value Measurement Levels

Davenport (1993) argued that business activities should be broken down into business processes, and these business processes should be considered in terms of the capabilities they can provide. Further, Alter (2003) argues that the first focal point of the IS research should be IT-reliant work processes or work systems whose efficient and effective operation depends on IT, and performance measurement should occur at the process level. We expand this argument and suggest that the IT resources, complementarities, capabilities, and their interaction creates an IT related “information-database” that would be critical for businesses in carrying out its key objective of enhancing customer relationships. Once this is achieved, its benefits could then flow to the internal business process level value. Thus, we propose that:

Proposition 4: *Enhancement in customer relationship from IT resources and IT related capabilities, and in the presence of an IT-Usage platform will be positively associated with internal process level business value.*

Our propositions are summarised in the model depicted in Figure 1.

RESEARCH METHODOLOGY

We employed a survey research methodology, as it allowed us to cover the geographical location to contact respondents with minimal increased marginal cost, and it was the most economical option. The survey research instrument was developed in three stages with face validity and initial validity tested using expert groups in two rounds, and a pilot study, as measures were used in a different context. Most measures of constructs were sourced from literature. We used four measures for IT investments, and three measures for technical IT skills. Two items measured top management commitment adopted from Powell and Dent-Micallef (1997), five items measured shared knowledge adopted from Boynton et al., (1994), and five items also measured flexible IT infrastructure adopted from Duncan (1995) and focused on the level of IT platform standardisation. The effectiveness of IT steering committee was used to measure the perceived level of IT governance, adopted from Karimi et al., (2000), eight items measured organisational design adopted from (Osterman, 1994), and five items measured incentive systems adopted from (Brynjolfsson and Hitt, 1998). Internal business processes is measured using four items, sourced from Mitra and Chaya (1996) and seven items measured customer relationship adopted from (Ray et al., 2005).

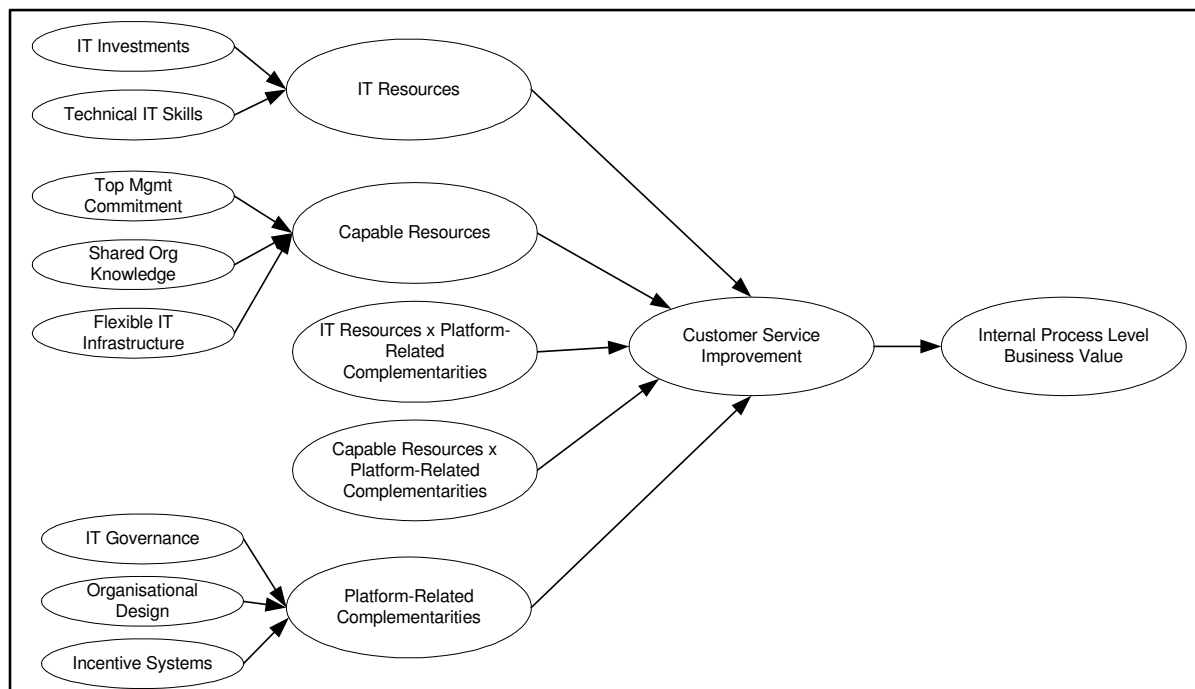


Figure 1. Research Model

DATA COLLECTION AND ANALYSIS

Sample

We invited senior executives to participate in the survey. We used mail and online survey. The target respondent list was compiled from a publically available database that included 1950 companies. We received 210 valid responses, giving a final response rate of 12.4%. Analysis of the demographic data indicated respondents were representative of the target population, our testing of non-response bias and two modes of data gathering did not identify any issues.

Measurement Model

We used PLS to test our propositions. Results of the PLS component based analysis, correlations amongst constructs, and reliability tests are provided in Table 1. While there were some cross-loading, the measures loaded highly on their own construct. The Cronbach's Alpha of items within each construct is reasonably high (greater the 0.7 benchmark) (Nunnally, 1978). The composite reliabilities, which avoid the assumption of equal weighting on items, were above 0.80 level, and the average variance extracted (AVE) were above the recommended 0.50 level (Chin, 1998). In summary, these results support the convergent and discriminant validity of our constructs.

Construct	Cronbach's Alpha	Composite Reliability	AVE	ITINV	TKLSKLS	TMC	SOK	FLEX	ITG	ORGDES	INCENT	CUST	PRO
IT Investments (ITINV)	.77	.86	.67	1									
Technical Skills (TKLSKLS)	.87	.92	.80	.27	1								
Top Mgmt Commitment (TMC)	.94	.97	.94	.30	.15	1							
Shared Org. Knowledge (SOK)	.90	.93	.72	.27	.32	.53	1						
Flex. IT Infrastructure (FLEX)	.72	.82	.54	.36	.28	.23	.54	1					
IT Governance (ITG)	.93	.94	.70	.37	.28	.24	.43	.35	1				
Organisational Design (ORGDES)	.74	.81	.54	.11	.06	.24	.37	.55	.23	1			
Incentive Systems (INCENT)	.81	.83	.52	.35	.08	.49	.56	.23	.30	.30	1		
Customer Service (CUST)	.96	.96	.79	.28	.15	.28	.43	.43	.30	.27	.27	1	
Internal Business Processes (PRO)	.88	.91	.72	.25	.20	.26	.55	.36	.36	.16	.36	.41	1

Table 1. Consistency, Reliability and Inter-Construct Correlations

Structural Model

In order to test the interaction effect, we ran two models; the main effects model and the interaction model. Figure 2 and 3 presents the description of these PLS results. The direct effect model provides standardised beta of 0.034 for IT resources, 0.383 for capable resources and 0.133 for platform related complementarities. The coefficients indicate IT resources have a direct but marginal positive impact on customer service improvement, while capable resources have a statistically significant impact. The model accounts for 28 percent of the variance in customer service improvement, and it is also positively and significantly associated to process level business value. The interaction model shows that while the platform related complementarities on their own do impact customer service improvement, they have an interaction effect of 0.652 on capabilities, and 0.354 on IT resources. This means that the complementarities increase the effect of IT resources from -.202 to 0.184 (0.034 in direct effects model), and of capabilities from -0.061 to 0.592 (0.383 in direct effects model). As expected, the main effects model resulted in lower standardised beta and a lower R² of 0.281. The interaction construct using (Cohen, 1988) formula has a size effect of 0.08, indicating higher end of small effect. The t-values derived from bootstrapping indicate most paths are significant and are shown in parentheses in the models. These results are discussed next.

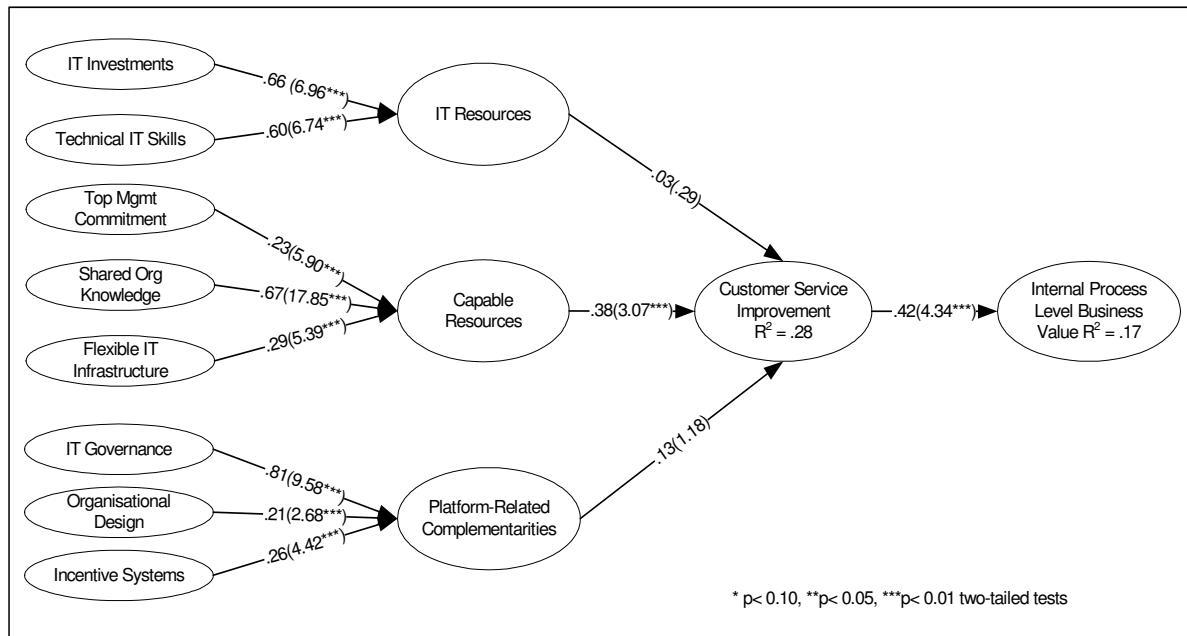


Figure 2. Direct Effects Model

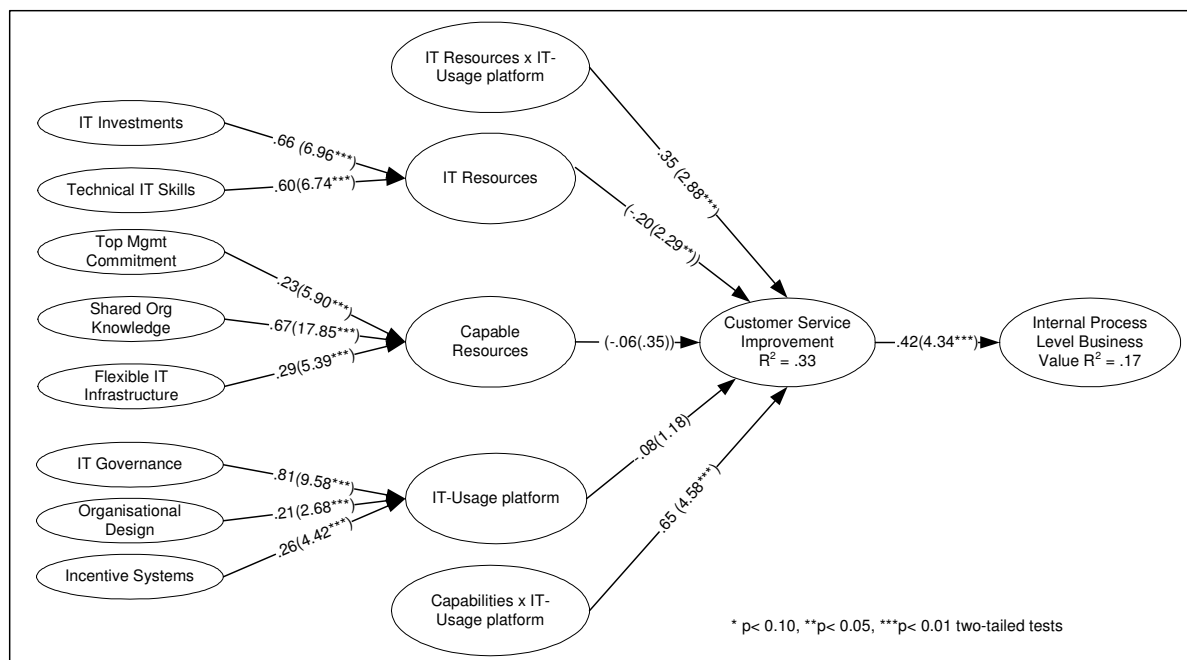


Figure 3. Interaction Effects Model

DISCUSSION

Investment into IT occupies a substantial portion of organisations' resources to improve their business performance. While explaining how IT affects performance is challenging, our proposition that the IT resources and organisational capabilities may flourish in complementary environment is a step in that direction. Our study helps to explain why some firms may be

able to perform better from their IT resources and their capabilities than others, and represents that IT effects appear at process level, both internally and externally.

Theoretically, this study suggests that complementary theory provides ideal framework to consider the environment within which the IT, and capable resources within the resource based logic is able to explain variance in this process level performance. This study contributes to the discussion that IT resources can contribute to efficiency and effectiveness in an absolute sense, but also by the capable resource attributes of the IT resources that contribute to sustained advantage for firms. We have expanded this concept, and have shown that not only IT resources, but IT related organisational capabilities too can provide more value in an accompanying complementary environment at enhancing customer service, which then improves business value at the process level. Our results are largely consistent with resource-based and complementary theory expectations as capable resources ability to explain variance in process performance is enhanced in the presence of complementarities.

Practically, our results suggest that to ensure sustained value, a sound culture of IT deployment is essential. Specifically, the results suggest that the variation in business process performance is explained at the level of a firms IT resources, the level of partnership between IT and business managers, the flexibility of the organisation's IT infrastructure, and the commitment of top management in IT related initiatives. Importantly, our result indicate that organisations IT and business managers are able to foster greater partnership, top management is able to commit more to IT, there is better sharing of organisational knowledge, and better utilisation of IT resources in the presence of a sound platform comprising of a good governance structure, an organisational design that promotes IT usage and a reward system that is aligned towards the commitment of the businesses' IT usage. This reaffirms the growing consensus that it is the context within which IT is applied that is important, and the contingency relationship between IT resources, capable resources and IT usage environment is supportive of this notion.

LIMITATIONS

Like all research, this paper has some weakness. First, a response rate of 12.4% might be of concern. However, this is consistent with other studies using executive management as the target respondents and respondents were representative of the sampling frame. Second concern is the use of perceptual measures of business value. In choosing the outcome variables, the suggestion of Wade and Hulland (2004) was considered. Further, the use perceptual measures is common in prior studies, and these measures have been shown to correlate strongly with traditional objective measures (Venkatraman and Ramanujam, 1987). Finally, we have only considered interaction between a few complementary and capable resources, and there is scope to expand on consider other such resources and the impact of their interaction to business value.

CONCLUSION AND FUTURE RESEARCH

Undeniably, IT resources are important for businesses, but it is equally important that firms are able to understand their capabilities, their culture, and their operating environment, and blend these to foster a unique resource that could help generate better value from their IT investments. We have shown one such blend in the presence of platform related complementarities, and there is much more to be understood in where greater business value can be derived from IT investments. This needs to be examined in continued future research.

REFERENCES

1. Alter, S. (2003) 18 Reasons Why IT-Reliant Work Systems Should Replace 'The IT Artifact' as the Core Subject Matter of the IS Field, *Communications of the AIS*, 365-394.
2. Baily, T. (1993) Discretionary Effort and the Organization of Work: Employee Participation and Work Reform since Hawthorne Working Paper, Columbia University, New York.
3. Barney, J.B. (1991) Firm Resources and Sustained Competitive Advantage, *Journal of Management*, 17, 1, 99-120.
4. Barua, A., Kriebel, C.H. and Mukhopadhyay, T. (1995) Information Technologies and Business Value: An Analytic and Empirical Investigation, *Information Systems Research*, 6, 3-23.
5. Barua, A. and Lee, B. (1997) The information technology productivity paradox revisited: A theoretical and empirical investigation in the manufacturing sector, *International Journal of Flexible Manufacturing Systems*, 9, 2, 145-166.
6. Bharadwaj, A.S., Bharadwaj, S.G. and Konsynski, B.R. (2000) A Resource Based Perspective of IT Capability and Firm Performance: An Empirical Investigation, *MIS Quarterly*, 24, 1, 169-196.
7. Boynton, A.C., Zmud, R.W. and Jacobs, G.D. (1994) The influence of IT management practice on IT use in large corporations, *MIS Quarterly*, 18, 3, 299.

8. Broadbent, M. (2005) Why Governance Matters; Good IT Governance is the Secret Weapon of Effective CIOs and Agile Organisations - But it has to be Done Right, *CIO Insight*, 60, 1, 1.
9. Brynjolfsson, E. (1993) The Productivity Paradox of Information Technology, *Communications of the ACM*, 36, 12, 67-77.
10. Brynjolfsson, E. and Hitt, L.M. (1998) Information Technology and Organisational Design: Evidence from Micro Data, Working Paper, MIT Sloan School of Management.1-47.
11. Chin, W. (1998) Issues and opinions on structural equation modeling, *MIS Quarterly*, 22, 1, 7,10.
12. Clemons, E.K. and Row, M.C. (1991) Information Technology at Rosenbluth Travel: Competitive Advantage in a Rapidly Growing Global Service Company, *Journal of Management Information Systems*, 8, 2, 53-80.
13. Cohen, J. (1988) Statistical power analysis for the behavior sciences, Erlbaum, Hillsdale, NJ.
14. Copeland, D.G. and McKenney, J.L. (1988) Airline Reservations Systems: Lessons From History., *MIS Quarterly*, 12, 3, 352.
15. Davenport, T. (1993) Process Innovation: Reengineering Work through Information Technology B2, Harvard Business School Press, Boston, MA.
16. Duncan, M.B. (1995) Capturing Flexibility of Information Technology Infrastructure: A study of resource characteristics and their measure, *Journal of Management Information Systems*, 12, 2, 37,21.
17. Edgeworth, F.Y. (1881) Mathematical Physics, Kegan Paul, London.
18. Henderson, J. and Venkatraman, N. (1993) Strategic Alignment: Leveraging Information Technology for Transforming Organizations, *IBM Systems Journal*, 32.
19. Hitt, L.M. and Brynjolfsson, E. (1997) Information Technology and Internal Firm Organization: An Exploratory Analysis, *Journal of Management Information Systems*, 14, 81-101.
20. Information Technology Governance Institute (2006) Enterprise Value: Governance of IT Investments. The Val IT Framework, www.itgi.org.
21. Jensen, M. and Meckling, W. (1992) Knowledge, Control and Organisational Structure, in L. Werin and H. Wijkander (Eds.) *Contract Economics*, Blackwell, Cambridge, 1992.
22. Mata, F.J., Fuerst, W.L. and Barney, J.B. (1995) Information technology and sustained competitive advantage: A resource-based analysis, *MIS Quarterly*, 19, 4, 487-505.
23. Melville, N., Kraemer, K. and Gurbaxani, V. (2004) Information Technology and Organizational Performance: An Integrative Model of IT Business Value, *MIS Quarterly*, 28, 2, 283-321
24. Milgrom, P. and Roberts, J. (1990) The economics of modern manufacturing: Technology, strategy, and organization, *American Economic Review*, 80, 511-528.
25. Mitra, S. and Chaya, A.K. (1996) Analyzing Cost Effectiveness of Organizations: The Impact of Information Technology Spending, *Journal of Management Information Systems*, 13, 2, 29-57.
26. Nelson, K.M. and Coopridge, J.G. (1996) The contribution of shared knowledge to IS group performance., *MIS Quarterly*, 20, 4, 409.
27. Nunnally, J.C. (1978) Psychometric Theory, McGraw-Hill, New York, NY.
28. Osterman, P. (1994) How Common is Workplace Transformation and Who Adopts it?, *Industrial and Labour Relations Review*, 47, 2, 173-188.
29. Powell, T.C. and Dent-Micallef, A. (1997) Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources, *Strategic Management Journal*, 18, 5, 375-405.
30. Ray, G., Muhamma, W.A. and Barney, J.B. (2005) Information Technology and the Performance of Customer Service Process: A Resource-Based Analysis, *MIS Quarterly*, 29, 4, 625-653.
31. Tallon, P.P. (2007) A Process-Oriented Perspective on the Alignment of Information Technology and Business Strategy, *Journal of Management Information Systems*, 24, 3, 227-268.
32. Turban, E., Leidner, D., McLean, E. and Wetherbe, J. (2008) Information Technology for Management: Transforming Organisations in the Digital Economy, John Wiley and Sons, Inc.
33. Van Grembergen, W. (2000) The Balanced Scorecard of IT Governance, *ISACA Control*, 5.
34. Venkatraman, N. and Ramanujam, V. (1987) Measurement of Business Economic Performance: An Examination of Method Convergence *Journal of Management*, 13, 1, 109-122.
35. Wade, M. and Hulland, J. (2004) Review: The resource-based view and information systems research: Review, extension, and suggestions for future research, *MIS Quarterly*, 28, 1, 107-142.
36. Wreden, N. (1997) Business-Boosting Technologies, *Beyond Computing*, November-December